

prey item in the absence of a predator regularly eating it. Thus it is possible that all 3 species found by us in European raccoons refer to "letters delivered to wrong address" which normally occur in other mammals. Voucher specimens are available from Institute of Zoo Biology and Wildlife Research, PF 1103, D-10252 Berlin, Germany: Collection of Protozoa, No. kT 68/60-W 1115/92 (histological sections of loin with *S. sp. 1*), and No. kT 66/57-W 24 (histological sections of tongue with *S. cf. sebeki*).

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Research Note

Helminths of Cetaceans on the Southeastern Coast of Brazil

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ABSTRACT: Seventy cetaceans accidentally captured in fishing nets in Rio de Janeiro State (Brazil) were dissected for parasites. *Sotalia fluviatilis* (Delphinidae) harbored *Braunina cordiformis*, *Halocercus brasiliensis*, and *Anisakis typica*. *Tursiops truncatus* (Delphinidae) was parasitized by *Nasitrema* sp. and *B. cordiformis*. *Steno bredanensis* (Delphinidae) had only *B. cordiformis*. *Sotalia fluviatilis* represents a new host record for *Braunina cordiformis* that is reported for the first time from Brazil. In an attempt to correlate these cetaceans' parasite infections with their food habits, a survey was made on fish of 20 species and *Loligo sanctipaulensis* (Cephalopoda) from the same area. Only *Bagre bagre*, *Macrodon ancylodon*, and *Nebris microps* contained *Anisakis* sp. larvae, a parasite species in-

fecting cetaceans. Lack of parasites in 42 *Pontoporia blainvillei* (Pontoporiidae) within our study area was probably related to the age of the hosts and differences in food habits between young and adults.

KEY WORDS: marine mammals, Cetacea, parasites, Brazil, *Braunina cordiformis*, *Anisakis typica*, *Halocercus brasiliensis*, *Nasitrema*.

Despite the long Brazilian coastline (about 8,700 km), the parasite fauna of marine mammals in this part of the Neotropical region is largely unknown. Previous studies in Brazil are restricted to only 2 reports: *Halocercus bras-*

iliensis Lins de Almeida, 1933 from the lungs of *Sotalia fluviatilis* (Gervais, 1853) (Delphinidae), from Guanabara Bay, Rio de Janeiro (Lins de Almeida, 1933), and *Anisakis alexandri* sp. nq. (Hsu and Hoeppli, 1933–1934) reported by Zam et al. (1970) in freshwater *Sotalia fluviatilis* imported from the upper Amazon river to Florida.

From September 1989 to June 1993, 70 cetaceans were accidentally captured throughout the year in fishing nets in Rio de Janeiro State, between Atafona (21°37'S, 41°02'W) and Macaé (22°23'S, 41°47'W): 42 *Pontoporia blainvillei* (Gervais and d'Orbigny, 1844) (Pontoporiidae), 23 *Sotalia fluviatilis* (Gervais, 1853) (Delphinidae), 4 *Tursiops truncatus* Montagu, 1821 (Delphinidae), and 1 *Steno bredanensis* Lesson, 1828 (Delphinidae).

Due to the fact that *Pontoporia blainvillei* and *Sotalia fluviatilis* are included in The Official List of Brazilian Fauna Threatened with Extinction, our sample of 70 cetaceans represents an important data set for the knowledge of the biology of these mammals and their helminths in the occidental South Atlantic Ocean.

Cetaceans were brought to the laboratory 24–48 h after death. In the necropsy, nasal cavity, mouth, and all internal organs were macroscopically examined in each animal. All parasites recovered were dead and some of them were damaged. For each host they were counted and fixed in 5% formalin.

To determine possible intermediate hosts, 117 fresh fish of 20 species and 28 squids from the same area were obtained from fishermen and examined for parasites. The trematodes were stained with alcoholic chlorhydric carmine (Langeron, 1949) and mounted in Canada balsam. Nematodes were studied after clearing in creosote, phenol, or acetic acid. The helminths were identified by one of us (C.P.S.) and are deposited in the Helminthological Collection of Oswaldo Cruz Institute, RJ with numbers 32.964 (*Nasitrema* sp.), 32.965 (*Braunina cordiformis*), 32.966 (*Anisakis typica*), and 32.967 (*Halocercus brasiliensis*).

In Rio de Janeiro State, of 23 *Sotalia fluviatilis* examined (12 males [107–193 cm long, mean = 165, SD = 27.3] and 11 females [158–193 cm long, mean = 177, SD = 10.6]), 19 were infected with the stomach trematode *Braunina cordiformis* Wolf, 1903 (mean intensity = 76, range 1–318, SD = 107.8, prevalence = 34%) and the nematodes *Anisakis typica* (Diesing, 1861) (stomach, mean intensity = 16, range 1–52, SD

= 19.9, prevalence = 48%) and *Halocercus brasiliensis* (lungs and trachea, mean intensity = 7, range 2–15, SD = 5.9, prevalence = 13%).

One of 4 specimens of *Tursiops truncatus* (3 males 184, 200, and 237 cm long, and one female 162 cm long), harbored 30 specimens of the trematode *Nasitrema* sp. in the nasal cavity and another 24 *Braunina cordiformis* in the stomach. Two were uninfected.

The single *Steno bredanensis* (female, 250 cm long) examined had 957 *Braunina cordiformis* in the stomach and the anterior part of the intestine.

Pearson's correlation test showed no significant correlation between sex and size of hosts (*S. fluviatilis*) with infections of *A. typica*, *H. brasiliensis*, and *B. cordiformis*, and with infections of all parasite species tested together, although all 4 uninfected *S. fluviatilis* were male and 2 of them were the smallest animals dissected (107 and 129 cm in length).

Forty-two *Pontoporia blainvillei* (18 males [14 measured: 95–118 cm long, mean = 105, SD = 6.9] and 24 females [21 measured: 74–141 cm long, mean = 116, SD = 17.4]) studied from the same area did not yield any parasites.

In order to find clues for these striking differences in infections of different host species, we looked for parasites in potential prey species we commonly find in the cetaceans' stomach in this region. Fishes examined by us include: Sciaenidae: 21 *Paralichthys brasiliensis* (Steindachner, 1875) (range 10–22.5 cm, mean = 16), 13 *Macrondon ancylodon* (Bloch and Schneider, 1801) (range 11–20 cm, mean = 16), 12 *Stellifer brasiliensis* (Schultz, 1945) (range 8–20 cm, mean = 14), 8 *Nebris microps* Cuvier, 1830 (range 12–19 cm, mean = 15), 6 *Cynoscion leiarchus* (Cuvier, 1830) (range 9.5–16.5 cm, mean = 12), 3 *C. virescens* (Cuvier, 1830) (range 14–20 cm, mean = 17), 3 *Isopisthus parvipinnis* (Cuvier, 1830) (range 10.3–13.5 cm, mean = 11), and 1 *Menticirrus americanus* (Linnaeus, 1758) (15.2 cm); Stomateidae: 17 *Peprilus paru* (Linnaeus, 1758) (range 8.5–13 cm, mean = 10); Ariidae: 14 *Bagre bagre* (Linnaeus, 1766) (range 11–19.5 cm, mean = 16); Engraulidae: 6 *Anchoa spinifera* (Valenciennes, 1848) (range 12–17 cm, mean = 13); Tetraodontidae: 4 *Logocephalus laevis* (Linnaeus, 1766) (range 5–11 cm, mean = 7); Cynoglossidae: 3 *Symphurus tessellatus* (Quoy and Gaimard, 1824) (range 11–21 cm, mean = 16); Batrachoididae: 1 *Porichthys porosissimus* (Valenciennes, 1837) (20 cm); Haemulidae: 1 *Pomadasys corvinaeformis* (Steindachner, 1868) (10

cm); Ophichthidae: 1 *Ophichthys parilis* (Richardson, 1844) (45 cm); Pomadasysidae: 1 *Conodon nobilis* (Linnaeus, 1758) (10.5 cm); Soleidae: 1 *Trinectes paulistanus* (Ribeiro, 1915) (10 cm) and Trichiuridae: 1 *Trichiurus lepturus* Linnaeus, 1758 (37.5 cm).

Only one fish each of *Bagre bagre*, *Macrodon ancylodon*, and *Nebris microps* contained larval *Anisakis* sp., a species infecting cetaceans. Because loliginid squids also contribute to the diet of these cetaceans, 28 *Loligo sanpaulensis* Brakoniecki, 1984 (mantle length range 4–7 cm, mean = 5) were examined, but none of them were found infected.

Raga (1994) presented a list of parasites of *Tursiops truncatus* and *Steno bredanensis*. Previous studies of parasites of *Pontoporia blainvillei* revealed the following helminths: *Contracaecum* sp. (Dailey and Brownell, 1972; Brownell, 1975, 1981; Praderi, 1984), *Polymorphus* (P.) *cetaceum* (Brownell, 1975, 1981; Praderi, 1985; Aznar et al., 1994), *Phyllobothrium delphini* (Testa and Dailey, 1976); *Anisakis typica* (Kagei et al., 1976; Praderi, 1984, 1985), *Procamallanus* sp. (Praderi, 1984, 1985), *Anisakis simplex* and Polymorphidae sp. (Aznar et al., 1994), *Hadwenius pontoporiae*, and *Pholeter gastrophilus* (Raga et al., 1994; Aznar et al., 1994). In *Sotalia fluviatilis* various authors reported *Amphimerus lancea*, *Halocercus brasiliensis* (Dailey and Brownell, 1972), *Anisakis typica*, and *A. alexandri* sp. n. (Zam et al., 1970). For the first time, *Braunina cordiformis* is reported from the Brazilian coast, parasitizing 3 different hosts: *T. truncatus*, *S. bredanensis*, and *S. fluviatilis*. *Sotalia fluviatilis* constitutes a new host record for *Braunina cordiformis*.

The sample of *P. blainvillei* was not parasitized and this could be related to the age, size, and food habits of our specimens. Brownell (1984) reported that *Pontoporia* calves start taking solid food at about 3 months of age when animals are about 100 cm in length, and that males and females attain sexual maturity on average at lengths of about 131 and 140 cm, respectively, at a mean age of 2.7 years. The material we examined was composed mainly of younger individuals ranging from 74 to 141 cm long.

In the south of Brazil adults of *P. blainvillei* eat any prey as long as it is smaller than 50 mm and younger individuals generally eat more shrimps and squids than adults. The fish reported from their diet in southern Brazil (Pinedo, 1982) did not include any of those found to carry *An-*

isakis sp. in our area: *M. ancylodon* (total length 16.5 cm), *B. bagre* (total length 15 cm), and *N. microps* (total length 19 cm). On the other hand, *M. ancylodon* (larger than 1 cm) was found in the stomachs of *S. fluviatilis*, *S. bredanensis*, and *T. truncatus* studied by us. The lack of *A. typica* in *T. truncatus* and *S. bredanensis* is probably related to the small sample size, 4 and 1 hosts examined respectively.

In the Pontoporiidae studied, of which only 2 could be considered adults, age and preference for small prey (mainly squid instead of fish) could be a likely reason to explain the lack of infections of such hosts since the squid and small fish examined were not parasitized. The preference of *S. fluviatilis* and *T. truncatus* for prey larger than 100 mm reinforces this hypothesis. Absence of parasites in *Pontoporia blainvillei* in our study area could also be a local phenomenon related to the absence of suitable intermediate or transport hosts, or to the lack of infections of such hosts with cetacean parasites in our study area, since some helminth species were recovered from this host species by other researchers.

Raga et al. (1994) discussed the difference between the high prevalence of one trematode species, *Hadwenius pontoporiae*, found in *P. blainvillei* from Argentina, and the absence of this parasite in previous reports from Uruguayan waters just 500 km away. Aznar et al. (1994) also reported helminths in 46 *P. blainvillei*, with a mean age of 2.9 years, from Argentinean waters, suggesting that many characteristics of their helminth communities can at least partly be explained by ecological processes.

Studies on marine mammals generally do not report the age, size, and food habits of hosts, together with the occurrence of parasites. The lack of this information, especially in hosts with distinctive food habits, can make an understanding of the host–parasite relationship difficult. We suggest therefore that in future studies this information be included whenever possible.

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